# DECLARATION

I, Hideaki Shiotani, c/o TMI ASSOCIATES of 23rd Floor, Roppongi Hills Mori

Tower, 6-10-1, Roppongi, Minato-ku, Tokyo 106-6123, Japan, do solemnly and sincerely

declare that I well understand the Japanese and English languages and that the attached

English version is full, true and faithful translation made by me this 26th day of November 2009

of the certified copy of Japanese Patent Application No. 2002-299521 filed before the

Japanese Patent Office on the 11th day of October 2002.

In testimony whereof, I have hereunto set my name and seal this 26th day of November

2009.

November 26, 2009

Hideaki Shiotani
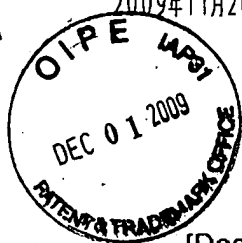
(Translation)

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(57) [Abstract]

[Problem to be Solved] An object of the present invention is to propose technology whereby even a player with a low skill level can enjoy a shooting game with more excitement.

[Means for Solving the Problem] If a player outputs a slow regeneration request signal when processing transits to the status where an enemy-character (31) is about to fire a bullet (40), the enemy-character (31) and the bullet (40) fired by the enemy-character (31) are regenerated slowly. By this, the player can blast the bullet (40) by aiming (50) at the bullet (40) with extra time.

[Selected Drawing]　Fig. 6

[Claims]

[Claim 1]

A computer program, in which a player-character who virtually fires bullets responding to an input operation of a player and an enemy-character who is computer-controlled to virtually fire bullets at said player-character are disposed in a virtual space, and which causes a computer system to execute processing for displaying on a screen a status in said virtual space viewed from a virtual viewpoint, wherein said computer program causes said computer system to execute:

a visual effects request input determination step for determining whether a visual effects request input for requesting visual effects processing is performed by a player;

if said visual effects request input is performed, a visual effects processing step for performing image display processing by making the display speed of at least said enemy-character and each one of the bullets fired from said enemy-character slower than the display speed of objects displayed in association with the player's operation;

in said visual effects processing step, a collision determination step for performing collision determination between a moving locus of a bullet fired from said

4

player-character and at least either said enemy-character which is a shooting target

or one of the bullets fired from said enemy-character;

in said collision determination step, if the moving locus of the bullet fired from

said player-character and said shooting target collide with each other, a shot image

display step for displaying an image of said shooting target being shot at on said

screen; and

a remaining time display step for displaying on said screen an elapsed

amount of remaining time during which said visual effects enable processing step

can be executed.

[Claim 2]

The computer program according to Claim 1, wherein said computer

program causes said computer system to execute:

a bullet fire wait status determination step for determining whether

processing transits to a bullet fire wait status where a bullet is fired from said

enemy-character to said player-character at least within a predetermined time; and

if processing transits to said bullet fire wait status, said visual effects request

input determination step.

[Claim 3]

The computer program according to Claim 3, wherein said computer program causes said computer system to execute:

a measuring step for measuring an elapsed time amount at which said visual effects enable processing step is not executed; and

a remaining time update step for increasing said remaining time according to said elapsed time amount measured in said measuring step.

[Claim 4]

The computer program according to Claim 3, wherein said computer program causes said computer system to execute:

a play mode determination step for determining whether the mode is a mode where two or more players play; and

if it is determined in said play mode determination step that the mode is a mode where two or more players play, a step for updating said remaining time so that an increasing amount of said remaining time in said remaining time update step is different from an increasing amount of said remaining time in a mode where one player plays.

[Claim 5]

The computer program according to any one of Claim 1 to Claim 4, wherein said computer program causes said computer system to execute:

a step for determining whether said visual effects processing step is being executed; and

if it is determined that said visual effects processing step is being executed, a step for applying to at least said enemy-character image effects processing in which a display mode visually changes before and after said visual effects processing is executed.

[Claim 6]

6

The computer program according to any one of Claim 1 to Claim 5, wherein said visual effects request input is a control signal which is output to said computer system when a foot pedal connected to said computer system is stepped on by a player.

[Claim 7]

A computer-readable recording medium having a computer program according to any one of Claim 1 to Claim 6 recorded thereon.

[Detailed Description of the Invention]

[0001]

[Technical Field to which the Invention Pertains]

The present invention relates to image processing technology suitable for shooting games.

[0002]

[Conventional Technology]

Japanese Patent Application Laid-Open No. H11-86038 (Patent Document 1) discloses image processing technology related to shooting games using computer graphics. In such shooting games, while a status of a player-character which the player operates, and an enemy-character, which is the target of the shooting of the player who shoot at each other, are displayed on a screen as an image viewed from a predetermined viewpoint a shooting game is performed, but in image processing, if the shooting input is detected in a status where the shooting target and the coordinates of the aiming position match in a frame, the image of the shooting target being shot at is written in the frame memory, and this is converted into video signals and displayed as an image in the next frame, so the status of the bullet flying is not displayed on the screen, only the flying locus of the bullet is temporarily displayed.

[0003]

[Patent Document 1]

Japanese Patent Application Laid-Open No. H11-86038

[Problems to be Solved by the Invention]

In the above image processing, however, the flying time of the bullet is virtually 0, so if the player-character is fired at by an enemy character, the player-character is always shot at and cannot avoid the bullet as long as the player-character and the aim match. Particularly in the case of a beginner, whose skill level is not high, the game ends in a short time, so improvements so that players do not become bored are necessary.

[0004]

With the foregoing in view, it is an object of the present invention to provide an image processing technology suitable for shooting games.

[0005]

[Means for Solving the Problems]

To solve the above problem, the computer program of the present invention is a computer program, in which a player-character who virtually fires bullets responding to an input operation of a player and an enemy-character who is computer-controlled to virtually fire bullets at the player-character are disposed in a virtual space, and which causes a computer system to execute processing for displaying on a screen a status in the virtual space viewed from a virtual viewpoint, wherein the computer program causes this computer system to execute: a bullet fire wait status determination step for determining whether processing transits to a bullet fire wait status where a bullet is fired from said enemy-character to said

9

player-character at least within a predetermined time; if processing transits to said bullet fire wait status, a visual effects request input determination step for determining whether a visual effects request input for requesting visual effects processing is performed by a player; if the visual effects request input is performed, a visual effects processing step for performing image display processing by making the display speed of at least the enemy-character and each one of the bullets fired from the enemy-character slower than the display speed of the objects displayed in association with the player's operation; in the visual effects processing step, a collision determination step for performing collision determination between a moving locus of a bullet fired from the player-character and at least either the enemy-characters which is a shooting target or one of the bullets fired from the enemy-character; in the collision determination step, if the moving locus of the bullet fired from the player-character and the shooting target collide with each other, a shot image display step for displaying an image of the shooting target being shot at on the screen; and a remaining time display step for displaying on the screen an elapsed amount of remaining time during which the visual effects enable processing step can be executed.

[0006]

According to the present invention, the player voluntarily requests visual effects processing on the condition that the enemy-character transits to bullet firing wait status, then the enemy-character and the bullet fired from this enemy character are slowly regenerated, therefore the player can shoot aiming at the enemy character or at this bullet with extra time, which makes a shooting game more exciting.

[0007]

Preferably, the computer system is caused to execute a measuring step for measuring an elapsed time amount at which the visual effects enable processing step is not executed; and a remaining time update step for increasing the remaining time according to the elapsed time amount measured in the measuring step. By this, time when the visual effects processing can be executed can be increased, so a shooting game can be more exciting.

[0008]

Preferably, the computer system is caused to execute a play mode determination step for determining whether the mode is a mode where two or more players play; and if it is determined in the play mode determination step that the mode is a mode where two or more players play, a step for updating the remaining time so that an increasing amount of the remaining time in the remaining time update

step is different from an increasing amount of the remaining time in a mode where one player plays.　By this, time when the visual effects processing can be executed can be adjusted according to the play mode, so a shooting game can be more exciting.

[0009]

Preferably, the computer system is caused to execute a step for determining whether the visual effects processing step is being executed, and if determined that the the visual effects prosessing step is being executed, a step for applying to at least the enermy-character image effects processing in which a display mode visually changes before and after the visual effects processing is executed.　By applying the image effects processing so that the display mode of the enemy-character is changed before and after the visual effects processing, a shooting game can be more exciting.

[0010]

It is preferable that the visual effects request input is a control signal which is output to the computer system when a foot pedal, connected to the computer system, is stepped on by a player.　In a shooting game, manual input is normally used, but by performing input operations using the foot, a player can focus only on manual input for shooting.

[0011]

The computer-readable recording medium of the present invention is a computer-readable recording medium having the computer program of the invention recorded thereon. Preferable examples of the computer readable recording medium onto which the program of the present invention is recorded include portable recording media such as optical recording media (recording media where data can be optically read, such as a CD-RAM, CD-ROM, DVD-RAM, DVD-ROM, DVD-R, PD disk, MD disk and MO disk), magnetic recording media (recording medium where data can be magnetically read, such as a flexible disk, magnetic card and magnetic tape), or memory cartridges comprising a memory element (a semiconductor memory element such as DRAM, a ferroelectric memory element such as FRAM).

[0012]

[Embodiments of the Invention]

Hereinafter, embodiments of the present invention will now be described with reference to each of the accompanying drawings.

[0013]

Fig. 1 is a configuration diagram depicting the hardware of a game machine according to the present embodiment. As Fig. 1 shows, to the game machine 10,

13

gun type controllers 20 and 21 and foot pedals 22 and 23 as the input means for the

player to perform game control, a video monitor (CRT display) 24 as the image

display means for displaying the game screen, and a speaker 25 as the sound

output means for outputting sound effects, are connected respectively. The gun

type controller 20 and the foot pedal 22 are the means for player A to control input,

and the gun type controller 21 and the foot pedal 23 are the means for player B to

control input. In other words, the configuration is such that, in a same virtual space,

two players can execute a shooting game simultaneously. The present embodiment

shows the system configuration for two players as an example, but the system is not

limited to this, but is designed such that a plurality of players can play by adding gun

type controllers, etc., as needed.

[0014]

Gun type controllers 20 and 21 are controllers which have such an

appearance as a machine gun, pistol, rifle and shot gun, and comprise trigger

switches (gun locks) 20a and 21a for the player to instruct firing bullets, and infrared

emitters 20b and 21b for emitting infrared radially. By the input operation of the

trigger switches 20a and 21a, infrared is emitted from the infrared emitters 20b and

21b to the video monitor 24. On the video monitor 24, a plurality of light receiving

14

sensors 24a are disposed surrounding the frame of the screen 24b, and the sensor

output of the light receiving sensor 24a is written to the input/output interface 11.

The input signals (trigger control signals) of the trigger switches 20a and 21a by the

player are output to the input/output interface 11 in the game machine 10.   Foot

pedals 22 and 23, on the other hand, are input means for the player to execute foot

input for the main CPU 12 to execute the later mentioned visual effects processing,

and are configured such that if it is detected that foot pedals are pressed down with a

predetermined stepping amount, a foot input signal is output to the input/output

interface 11.   The visual effects processing will be described in detail later.

[0015]

The game machine 10 is configured by comprising an input/output interface

11, main CPU 12, ROM 13, work RAM 14, video processor 15, frame memory 16,

D/A converter 17, sound processor 18 and sound memory 19.   The input/output

interface 11 determines the aiming position of the player, the presence of a fired

bullet, and the number of fired bullets from the sensor output signals and the trigger

control signals of the light receiving sensor 24a, and writes the corresponding flag to

a predetermined address in the work RAM 14.   The work RAM 14 is a random

access memory which functions as a work area for the main CPU 12 to execute

various operations for game processing.　In the ROM 13, a game program 13a,

polygon data 13b, geographic data 13c and time scale conversion table 13d are

stored respectively.　When the system is started up, the game program 13a, loaded

in the work RAM 14, is command-interpreted and executed by the main CPU 12, and

game processing is executed.

[0016]

The polygon data 13b is a data group of the relative coordinates or the

absolute coordinates of each vertex of a plurality of polygons constituting various

objects (e.g. characters and game backgrounds) to be displayed on the game screen.

The geographic data 13c, where a virtual viewpoint moves in the virtual space

according to developments of the game, is a data group of relative coordinates or

absolute coordinates of each vertex of polygons, which have relatively rough settings,

required for displaying a desired game screen.　The time scale conversion table 13d

is a table where the values of the time scale of all the objects displayed on the game

screen are stored, and are set such that the time scale of a predetermined object is

changed at the time of the later mentioned visual effects processing.　Here the time

scale is a multiplication coefficient of a moving vector (or moving amount) of an

object in one frame unit, and is normally set to 1.0.

16

[0017]

For determining the contact of the aiming and the shooting target, it is determined which position on the two-dimensional coordinates that a player is aiming at by the sensor output signal of the light receiving sensor 24a, then the two-dimensional coordinates are converted into three-dimensional coordinates, and a bullet is virtually fired in the depth direction. If the later mentioned visual effects processing is not executed, the image of the target being shot at is displayed at the aiming position, and the status of the bullet flying is not displayed, but if the visual effects processing is executed, the status of the bullet flying is written in the frame memory 16 for several frames, and the flying bullet is displayed on the video monitor 24 for a predetermined time.

[0018]

In the above description, a light receiving sensor 24a is disposed on the video monitor 24, and the aiming position of a player is judged from the output signal of this sensor, but the present invention is not limited to this, and it is acceptable that a plurality of infrared light emitting elements, instead of the light receiving sensor 24a, are disposed on the video monitor 24, lights emitted from the light emitting elements are detected by the light receiving sensor disposed in a gun type controller, and the

17

aiming position of the player is determined according to the received light intensity from each infrared light emitting element.

[0019]

Fig. 2 is a diagram for illustrating the moving vectors of an object. In Fig. 2, if it is assumed that the position vector of an object at the nth frame is pos, the position vector of an object at the (n+1)th frame is next_pos, and the moving vector of an object is spd*time_ratio, then next_pos = pos+spd*time_ratio is established. Here spd is a moving speed (moving amount for each frame) of an object, and time_ratio is a time scale. When the visual effects processing, such as slow regeneration, is executed, the moving speed of the object can be set to 1/n of normal speed by changing the time scale from 1.0 to 1/n (1≤n). In the time scale conversion table 13d, an object for which the time scale is changed when the visual effects processing, such as slow regeneration, is executed, and the corresponding time scale of the object before and after time scale conversion, are stored in advance. Fig. 4 shows the content of the data registered in the time scale conversion table 13d, where the time scale of an enemy-character and the bullet fired by this enemy-character are registered respectively. Here, the time scale before conversion is 1.0 and the time scale after conversion is 1/n.

[0020]

The main CPU 12 reads the polygon data 13b, geographic data 13c and time scale conversion table 13d based on the game program 13a, determines the coordinate value of each object in the world coordinate system based on the control signal from input means such as the gun type controllers 20 and 21, and converts this coordinate value into the visual field coordinate system in a conversion matrix. The video processor 15 pastes texture to the object converted into the visual coordinate system, and writes the drawing data to be displayed in the (n-1)th frame in the frame memory 16, and also reads the drawing data to be displayed in the nth frame from the frame memory 16 by double buffering, performs D/A conversion by the D/A converter 17, and displays the computer graphics image on the video monitor 24. The sound processor 18, on the other hand, writes digital sound data to the sound memory 19 so as to output sound corresponding to the game scene, and reads this, performs D/A conversion, and outputs such sound as sound effects via the speaker 25.

[0021]

Fig. 5 shows a screen example in the shooting game. In Fig. 5, 31a, 31b and 31c are enemy-characters, 32a, 32b and 32c are lock on cursors, 33 is the slow

19

gauge, 34 is the remaining number of bullets that a player can fire, 35 is an icon

displaying weapons that can be selected, and 36 is the score that a player amassed.

In the virtual space, a player operated by the player is disposed in addition to the

enemy-characters 31a, 31b and 31c shown in Fig. 5, and an image viewed from a

predetermined virtual viewpoint is displayed on the video monitor 24 as a game

screen.　In this case, the virtual viewpoint is set near the head of the

player-character, and an image viewed from the viewpoint of the player-character

(subjective viewpoint) is displayed, but the image is not limited to this, and an image

viewed from an objective viewpoint, where both the player-character and the

enemy-characters 31a, 31b and 31c are displayed on the game screen, may be

displayed (this is the same for the later mentioned description in Fig. 6).　In this

case, as Fig. 5 shows, an image viewed from the subjective viewpoint of the

player-character is displayed.

[0022]

The enemy-characters 31a, 31b and 31c are programmed so as to fire

bullets at the player-character according to a predetermined attack pattern based on

computer control.　Each one of the lock on cursors 32a, 32b and 32c is a cursor

which moves tracking each enemy-character 31a, 31b and 31c respectively, and the

firing of a bullet from an enemy character 31a, 31b or 31c is shown to the player by changing the color from green (indicated by a dotted line) to red (indicated by a solid line).   The present invention can be applied even if the lock on cursors 32a, 32b and 32c are not displayed.   The slow gauge 33 will be described in detail later.   In the example shown in Fig. 5, the lock on cursor 32a which is locked to the enemy-character 31a is displayed in green, but the lock on cursors 32b and 32c locked to the enemy characters 31b and 31c are displayed in red.   If the enemy characters 31b and 31c fire bullets here, and if the aim matches with the coordinates of the player-character, the player is instantaneously shot and damaged, without any time to avoid the bullet.   This is because it has been programmed such that the image of the player-character being shot is displayed in a frame next to the frame where the enemy characters 31b and 31c fired the bullets.

[0023]

Therefore in the present invention, the visual effects processing is performed on the game screen under predetermined conditions (hereafter called "visual effects processing enable conditions") to provide the player extra time to avoid a bullet. The visual effects processing enable conditions are conditions to be prerequisites to perform the visual effects processing on the game screen, and, for example, these

21

conditions are met when the status transits to the status where an attack from the

enemy-character 31 starts, that is when the status transits to the bullet firing wait

status, such as when the color of the lock on cursor 32 changes from green to red.

The main CPU 12 sets the visual effects processing enable flag to "1" in the work

RAM 14 when the visual effects processing enable conditions are established (when

the status transits to the bullet firing wait status). The visual effects processing is,

for example, performing slow regeneration processing only for the enemy-character

31 and the bullet fired by the enemy-character 31 by changing the time scale of the

enemy-character 31 and the bullet to 1/n. By such visual effects processing, the

operation speed of the player-character can be virtually quickened.   In other words,

the moving speed of the enemy-character and the bullet thereof become 1/n that of

the player-character, so the player can avoid the bullet with sufficient extra time, and

also the player can blast the bullet by aiming at this bullet. For the value of n, n =

10 for example is preferable.

[0024]

Fig. 6 shows a screen example of a shooting game when the visual effects

processing of the present embodiment is performed.   Identical reference numerals

as those in Fig. 5 indicate identical composing elements, for which detailed

22

explanations are omitted. When the lock on cursors 32b and 32c, locking the

enemy characters 31b and 31c, turn from green to red, the visual effects processing

enable conditions are established. Then shortly after this, the bullets 40a and 40b

are fired from the enemy-characters 31b and 31c. If the player performs a visual

effects request input after the visual effects processing enable conditions have been

established, the main CPU 12 generates a game screen where the visual effects

processing is applied, so the desired processing such as changing of the time scale

is performed. For the visual effects request input, a control signal input by the

player stepping on the foot pedals 22 and 23, for example, is preferable. This foot

control signal is output to the input/output interface 11 and is detected by the main

CPU 12. However the visual effects request is not limited to foot pedals, but may

be the input control of a switch for a visual effects request input, which is disposed

on the gun type controllers 20 and 21. Also the visual effects request may be the

input control of a switch for slow regeneration, which is disposed on the body of the

game machine 10, without using the gun type controller. When the visual effects

request input from the player is detected, the main CPU 12 converts the time scale

for a predetermined object (the enemy-character 31 and bullet 40 in this case), and

performs slow regeneration processing.

[0025]

Then the bullets 40a and 40b, which formerly have not been visually

displayed, are displayed on the game screen in slow regeneration. In this case,

many lines 60, which are like afterimages extending from the edge to about the

center of the screen, are displayed, which is image effects processing as if the

player-character were virtually moving at high-speed. By this, the player can

experience the sensation as if he/she were moving at high-speed, and can avoid the

bullets 40a and 40b with the extra time, since the moving speed of the

enemy-characters 31b and 31c and the bullets 40a and 40b is slow, and the player

also can blast the bullets 40a and 40b by adjusting the orientation of the gun type

controllers 20 and 21, pulling the trigger switches 20a and 21a while aligning the

aiming cursors 50a and 50b at the bullets 40a and 40b. Here the aiming cursor 50a

is an aiming cursor of the player A, and the aiming cursor 50b is the aiming cursor of

the player B. The blast processing of the bullet 40 by the aiming cursors 50a and

50b can be performed with a normal operation time. In other words, the display

speed of an object related to player' operation, such as the time from the player

executing the bullet firing operation to the bullet reaching the shooting target, the

24

time from the player selecting a weapon displayed at the icon 35 to the weapon

being displayed on the screen in response to the selection, and the moving time of

the aiming cursors 50a and 50b, are based on the normal display speed before the

visual effects processing is executed.　The slow gauge 33 is for indicating the

progress of time when slow regeneration processing can be executed as the visual

effects processing, and is designed such that the value of the gauge decreases as

the time for executing the visual effects processing elapses, and the visual effects

processing cannot be executed as game processing if this value becomes 0.　As

Fig. 6 shows, the display of the slow gauge 33 is enlarged on screen while visual

effects processing is being executed, and the remaining time during which the visual

effects processing can be executed is indicated for the player.

[0026]

Fig. 3 is a flow chart depicting the procedure of the visual effects processing

executed by the main CPU 12.　At first, the main CPU 12 monitors the work RAM

14 and checks whether "1" is set at the visual effects processing enable flag (step

S1).　If it is detected that "1" is set at the visual effects processing enable flag (step

S1: YES), the main CPU 12 checks whether the foot pedals 22 and 23 are stepped

on, and the foot input signal is detected (step S2).　If the stamp input signal is

detected (step S2: YES), the main CPU 12 changes the time scale of a predetermined character (enemy-character 31 and bullet 40 in this case) to 1/n (step S3), and executes the visual effects processing based on slow regeneration (step S4). And if the time during which the visual effects processing can be executed in a status where the foot pedals 22 and 23 are kept stepped on has elapsed (step S5: YES), the main CPU 12 returns the time scale of the above mentioned predetermined character to the original value (that is, time_ratio = 1.0) (step S6), and sets the visual effects processing enable flag to "0" (step S7). This may be constructed such that the time scale of the above mentioned predetermined character is returned to the original value in a phase when the player releases his/her foot from the foot pedals 22 and 23, regardless the processing in step S5.

[0027]

While the visual effects processing is performed, slow regeneration processing is executed only for the objects related to the enemy-character 31, and the player-character, of course, and the objects related to the player's operation, such as the speed of the value of the slow gauge 33 decreasing, the speed of the remaining number of bullets 34 decreasing, the display mode of the icon 35, and the increasing/decreasing speed of the number of points of the acquired score 36, are at

normal speed, and for which it is programmed such that slow regeneration

processing cannot be executed.　In the above description, the configuration is such

that the moving speed of the enemy-character 31 and the bullet 40 fired by this

enemy-character 31 are set to 1/n, and the moving speed of the objects related to

the player's operation is maintained at 1.0, but the present invention is not limited to

this, and it may be constructed such that the moving speed of the enemy-character

31 and the bullet 40 fired by the enemy-character 31 is set to 1/n, and the moving

speed of the objects related to the player's operation are set to 1/m using n and m

which relationship is n > m > 1.　In other words, the configuration is suffice if the

objects related to the player' operation is also displayed somewhat slower, but the

moving speed of the enemy-character 31 and the bullet 40 is regenerated slower

than this.

[0028]

When the duration of the visual effects processing exceeds a predetermined

value, the value of the slow gauge 33 becomes 0, and visual effects processing can

no longer be executed, but it may be constructed such that the value of the slow

gauge 33 is increased according to the duration in normal operation status, where

the visual effects processing is not applied.　In this case, it can be programmed

27

such that the maximum value of the slow gauge 33 is 6000 points (10 seconds if converted into time), and after a predetermined time (e.g. 2 seconds) has elapsed since the value of the slow gauge 33 becomes 0, the value of the slow gauge 33 is increased at every 2 points for 5 frames. If constructed in this way, the value of the slow gauge 33 recovers, so the player can use the visual effects processing again. In the case of the two player play mode, the recovery points of the slow gauge 33 may be set to be different from the recovery points of the one player play mode. It also may be constructed such that for the recovery processing of the slow gauge 33, a predetermined number of points (e.g. 4 points) are recovered if a bullet is fired at the enemy-character 31, a predetermined number of points (e.g. 8 points) are recovered if the enemy-character 31 is shot, a predetermined number of points (e.g. 1200 points) are recovered if a vital point of the enemy-character 31 is shot, and a predetermined number of points (e.g. 20 points) are recovered if the enemy-character 31 is hit continuously two or more times.

[0029]

In this way, according to the present embodiment, only the enemy-character 31 and the bullet 40 are slow-regenerated by the player stepping on the foot pedals 22 and 23 when the visual effects processing enable conditions are established, so

even a player whose game control is not very good can avoid the bullet 40, and

this allows implementing a shooting game that is not boring.　If the player has an

advanced skill level, the bullet 40 can be aimed at and blasted while the bullet 40

fired from the enemy-character 31 is slow-regenerated, so a more exciting shooting

game can be provided.　In the present embodiment, an example in which the

player-character and the enemy-character fight each other is shown, but the present

invention is not limited to this, but can be applied, for example, to a shooting game

where an object simulating a fighter aircraft or a combat vehicle are operated.

[0030]

[Effects of the Invention]

According to the present invention, the player voluntarily requests visual

effects processing on the condition that the enemy-character transits to bullet firing

wait status, then the enemy-character and the bullet fired from this enemy character

are slowly regenerated, therefore the player can shoot aiming at the enemy

character or at this bullet with extra time, which makes a shooting game more

exciting.

[Brief Description of the Drawings]

[Fig.1] Fig. 1 is a hardware configuration diagram of a game machine according to

the present embodiment;

[Fig.2] Fig. 2 is a diagram illustrating the moving vectors of an object;

[Fig.3] Fig. 3 is a flow chart depicting the procedure of visual effects processing of the present embodiment;

[Fig.4] Fig. 4 is a diagram illustrating registration content of a time scale conversion table;

[Fig.5] Fig. 5 is a diagram illustrating the game screen in a shooting game; and

[Fig.6] Fig. 6 is a diagram illustrating the game screen in a shooting game.

[Description of Reference Numerals]

10　game machine

11　input/output interface

12　main CPU

13　ROM

14　work RAM

15　video processor

16　frame memory

17　D/A converter

18　sound processor

19　sound memory

20, 21　gun type controllers

22, 23　foot pedals

24　video monitor

25　speaker

31　enemy-character

40　bullet

図訳

【図1】

10 GAME MACHINE

11 INPUT/OUTPUT INTERFACE

12 MAIN CPU

13 ROM

13a GAME PROGRAM

13b POLYGON DATA

13c GEOGRAPHIC DATA

13d TIME SCALE CONVERSION TABLE

14 WORK RAM

15 VIDEO PROCESSOR

16 FRAME MEMORY

17 D/A

18 SOUND PROCESSOR

19 SOUND MEMORY

24 VIDEO MONITOR

25 SPEAKER

【図2】

移動ベクトル　MOVING VECTOR

nフレームの位置ベクトル　POSITION VECTOR AT NTH FRAME

（n＋1）フレームの位置ベクトル　POSITION VECTOR AT (N+1)TH FRAME

【図3】

START

S1 VISUAL EFFECTS PROCESSING ENABLE FLAG = [1]?

S2 FOOT INPUT SIGNAL DETECTED?

S3 TIME SCALE CHANGE

S4 VISUAL EFFECTS PROCESSING

S5 TIME OUT?

S6 TIME SCALE RESTORATION

S7 VISUAL EFFECTS PROCESSING ENABLE FLAG = [0]

END

【図4】

TIME SCALE CONVERSION TABLE

OBJECT　　　BEFORE CONVERSION　　　AFTER CONVERSION

ENEMY-CHARACTER

BULLET OF ENEMY-CHARACTER